

3 Branches of the Same Tree: Art, Science and Education



A teacher's Resource Pack for
Key Stage 2 students



Focusing on curriculum topics:
Forces & Magnets, Light and Sound



Part 1 of 4: **Forces & Magnets**



Alongside the exhibition at Pump House Gallery
23 April - 31 May 2015

Introduction

3 Branches of the Same Tree brings together theories and concepts of science, art and education. The project has formed through the collaboration between three artists, three scientists and teachers from six Wandsworth-based primary schools. The aim was to create an exhibition of new work developed from research into Key Stage 2 curriculum areas of Light, Forces & Magnets and Sound. The exhibition aims to explore how art can be used as an access point into traditionally challenging areas, the outcomes of which are complemented by this Teacher's Resource Pack.

Beginning in September 2014, the project has involved each artist engaging in scientific research through close collaboration with a scientist and teachers from two Wandsworth primary schools. The process began with six working group sessions exploring the curriculum areas, where activities developed and ideas were tested out with students. Initially looking at the ways science can be taught, from January to March the artists' work developed as they applied their practice to question how the lenses of science and art affect our perception of the world.

This Resource Pack has been created alongside the artists' work as it has developed. Working with Primary Science Consultant Naomi Hiscock, Art Consultant John Tucker and Art Teacher Hazel Hardy, the activities in this Pack aim to locate the meeting point between art and science. Designed for and by Science teachers, it was vital that the art explored developed the students' scientific knowledge. As ideas were tested and checked over, the cross-overs between the practices of both scientists and artists became increasingly visible. The 18 activities bring together artists from around the world, linking those from the past and today and the work developed by the project artists. The activities not only meet the curriculum requirements but will inspire curiosity, learning and understanding of both art and science.

Artistic duo Semiconductor Ruth Jarman and Joe Gerhardt worked alongside biophysicist Ben Robinson and teachers Jane Bettles from West Hill and Jenny Taylor and Peggy Cowdry from St Anne's primary schools to explore Light. The group explored photograms by artist Man Ray, created

pumphousegallery

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first4magnets

Designed by © Caroline Claisse

Introduction

shadows of objects and paths of light as it reflects off surfaces. The critical moment that directed the outcome of the activities was the understanding that everything you see is reflected light. Early on in their research, Semiconductor came across a satellite called Landsat which captures images of the Earth and reflected light. Although this satellite programme has been running since 1972, in 2013 introduced a new band, 'Band 9', which captures a very small wavelength of light (1.38 microns) reflected from Cirrus clouds. Their work, *Band 9*, is an installation of light boxes presenting very high contrast, highly detailed images that capture the clouds from above and the reflected sunlight. Viewers are offered a different perspective of something familiar – the clouds from above.

Artist Alistair McClymont worked with neuroscientist Aleksandra Berditchenskaia and teachers Nancy Leeming and Nicolle Atkin from Griffin and Emma Pring and Kitty Russell from Falconbrook primary schools. Exploring students' understanding of how sound travels in vibrations, the group tested out ideas with elastic bands, specialist

technology and mark making. As the project developed, McClymont's work focused on the connection we have with sound from scientific perspectives through to its use in contemporary music. The work *One should never mistake pattern... for meaning (Function Generator)* has been set up as an ongoing project involving experiments in collaboration with Berditchenskaia, and live performances with scratch DJ and producer Prime Cuts and artist and musician Tom Richards.

Working with scientist Max Boleininger and teachers Sarah Daniell and Pat Dickens from All Saints CE and Lara Ahmoye from Hotham Primary Schools, artist Lyndall Phelps has researched the possibilities of forces and magnets. As they tested out ideas with students, Phelps became fascinated by the apparent magic of magnets. Phelps has developed a series of installations for the exhibition that invite visitors to explore and interact with the effects magnets have on their surroundings. Using specialist materials, such as powerful magnets and liquid magnets, Phelps provides opportunities to test out and explore the mysteries of magnets.

This Resource Pack is available as an online downloadable PDF. The exhibition (23rd April – 31st May) is open for school groups to visit. For more information, please contact the gallery on 020 8871 7572 or email info@pumphousegallery.org.uk

We would like to thank all the teachers, artists and scientists involved in making this pack. We would like to thank Clare Thurman, Action Learning Facilitator, Davina Salmon, Education and Social Services Department, Wandsworth Borough Council and Ella Lewis-Williams, Project Assistant and Danielle Morris, Pump House Gallery Intern. We would also like to thank first4magnets and Beehive Coil Ltd for their support in providing materials for the exhibition.

This project has been funded by Mayor of London and London School of Excellence.



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FORCES & MAGNETS

FORCES & MAGNETS

- | | |
|--|------|
| 1.1 How do objects move? | p.06 |
| 1.2 How do objects move on different surfaces? | p.13 |
| 1.3 Can magnets be used to move objects? | p.19 |
| 1.4 How can you make an object move using magnets? | p.25 |
| 1.5 How do magnets repel or attract other magnets? | p.29 |
| 1.6 Create a wire mobile that moves with both forces and magnets | p.33 |



How do objects move?

In this activity children will explore how objects can be made to move by applying a force. Inspired by the Spin Paintings by artist Damien Hirst and Jackson Pollock's work, children will experiment with different ways forces can be used to move paint.

National curriculum

SCIENCE OBJECTIVES

Pupils should be taught:

- ☐ That a force is required for an object to start moving (not NC objective).
- ☐ To notice that some forces need contact between two objects.
- ☐ The impact of the strength of force on an object (not NC objective).

ART AND DESIGN OBJECTIVES

Pupils should be taught:

- ☐ To develop their techniques, including their control and use of paint with creativity, experimentation, and an increasing awareness of different kinds of art, craft and design.
- ☐ To use a variety of methods and approaches to communicate observations, ideas and feelings, and to design and make images and artefacts.
- ☐ To improve their knowledge of great artists in history, including contemporary artist Damien Hirst and Abstract Expressionist artist Jackson Pollock.

RESOURCES

- ☐ Objects that move, for example: spinning tops, pop-up toys, clockwork toys, cars
- ☐ Plastic straws
- ☐ Paper
- ☐ Water-based paints
- ☐ Brushes
- ☐ Plastic trays
- ☐ Containers
- ☐ Artist resource images, internet access, computer, whiteboard
- ☐ Digital camera/iPhone
- ☐ Coins



1 Show the image of Damien Hirst's work from the Artist Resources and play video clip of Jackson Pollock, asking the children to think about:

Q What is happening to the paint in these videos?

<http://www.sfmoma.org/explore/multimedia/videos/250>

<https://www.youtube.com/watch?v=sOHQ9n6BeDk>

2 Provide the children with some toys that move to explore the different ways things can move.

Q As they explore, ask them to show and talk to their partner about how they make the toy move and to describe the motion of the toy e.g. when I push this button, the cow pops up.

3 Select three toys to talk about as a class, ensure they include a push, pull and twist. Display these three words and explain that these are all forces we use to make something move. Gather other words that the children used e.g. turn, press, squeeze and add these to the display.

4 Refer back to the work of Damien Hirst and Jackson Pollock, and discuss with the class how they think the paintings are made.

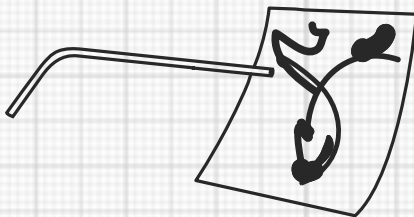
👉 Use the language the children recently used to describe how the toys move.

5 Set up a carousel of activities to explore different way of making marks using forces and paint – blowing with a straw, using a salad spinner and tilting and moving the paper.

TEACHER'S NOTES:**Blowing with a straw:**

Dispense a very small amount of paint (less than the size of a 5p coin) in the centre of an A3 sheet of white paper. The children will see they can create different shapes with the paint when blowing through the straw with varying force.

☞ Only a very small amount of paint is needed and the paper can be placed into a large tray to avoid mess.

**Using a salad spinner:**

If possible, use a salad spinner that has a flat circular base. Prior to the lesson, cut out circles of paper slightly smaller in size than the spinner's base. During the lesson, children should place their paper circles into the spinner, add 3 drops of paint (roughly the size of a 10p coin) before putting the lid back on and turning the spinner.

Tilting and moving the paper:

Line a plastic tray with a sheet of paper, using blue-tac to stick the paper down. Add one drop of paint (roughly the size of a 10p coin) and begin to tilt the tray so the paint moves.

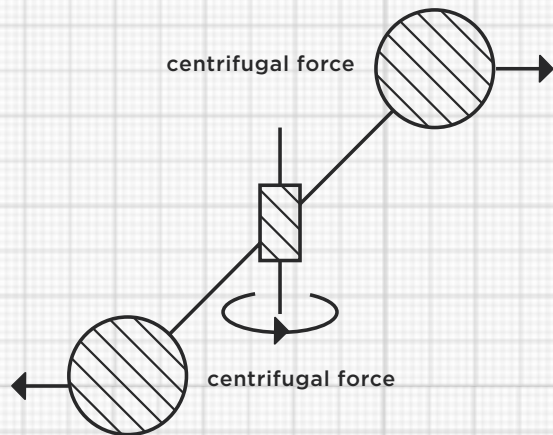


6 After the children have experimented with the paint, ask them to describe what is making the paint move?

☞ It is at this point that children should start identifying that for the paint to start moving there must have been a force, but in these cases the force is not visible.

TEACHER'S NOTES:

Blowing the paint is a contact force as the air is touching the paint. The salad spinner causes the paint to move outwards because of a centrifugal force. When the paper is tipped gravity causes the paint to move. These last two forces are non-contact forces.



7 Ask the children how they might change the lines of the paint and its shapes and patterns in the paintings.

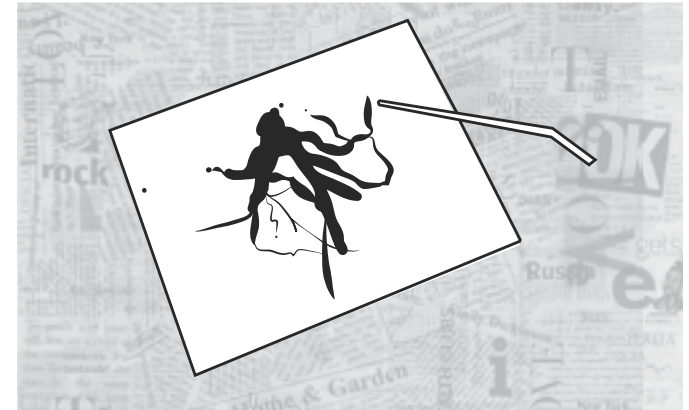
It is at this stage that the children will start to make a connection to how different forces make things move.

For example, ask the children to consider:

a What might happen if the paint has a thinner consistency?

b How might the lines of paint, shapes and patterns look different on surfaces by spinning the salad spinner at different speeds or lifting up the surface at different speeds?

c What might happen to the paint on the paper if you twist it or hold it at a different angle?



Blowing with a straw

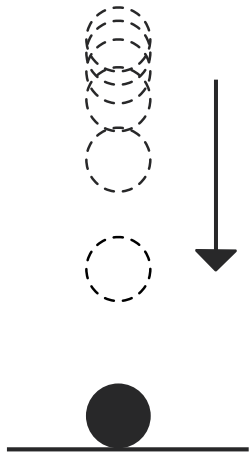
8 Selecting one new technique, ask the children to create a second painting to compare how the painting has then changed

9 As a group, ask the children to describe how their first painting was created, what they changed for the second painting and what has caused the changes.

EXTENSION ACTIVITY

Explore other ways of making marks using force. For example:

- ❶ Dropping an object into a container filled with rice: drop from various heights to explore the different marks it makes.
- ❷ In a container with paper in the bottom, use a marble to move a blob of paint.

**SCIENCE**

- ☐ Can the children describe forces in terms of cause and effect?
- ☐ Can the children describe the force that makes the paint start to move?

ART AND DESIGN

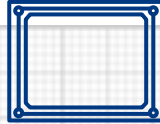
- ☐ Can the children describe what techniques both Pollock and Hirst have used to create their paintings?
- ☐ Can the children describe the lines created by the paint and the shapes they form?
- ☐ Can the children develop their artwork and suggest different ways of using the methods of Hirst and Pollock to create different works?
- ☐ What other materials could be used, and how might the results be different?

DAMIEN HIRST

<http://www.damienhirst.com>

🖱 Visit the following link to see more of Damien Hirst's *Spin Painting* series: http://www.damienhirst.com/artworks/catalogue?p=3&radiogroup_view=view_as_thumbs&category=2

Damien Hirst (born 1965, Bristol, UK) is a prominent member of the Young British Artists (or YBAs) – a group of artists that dominated the UK's art scene during the 1990s. Hirst is best known for his series of artworks of preserved dead animals (including a shark, sheep and cow) displayed in clear vitrines.



Hirst first experimented with what he calls 'spin art' in 1992, when he had a drawing machine especially made using a drill. By placing paint on this spinning circular surface, he created a series of works that are characterised by their bright colours, sense of movement and the elements of chance and spontaneity. The results of the spins are controlled purely by the artist's colour choices and the motion of the machine.

The works have been described by the artist as exploring the idea of "an imaginary mechanical painter", "a massive explosion of energy – full of life, colour and optimism" and that "the movement sort of implies life."

Source: <http://www.damienhirst.com/texts1/series/spins>



Beautiful, childish, expressive, tasteless, not art, over simplistic, throw away, kids' stuff, lacking in integrity, rotating, nothing but visual candy, celebrating, sensational, inarguably beautiful painting (for over the sofa) 1996
© Damien Hirst and Science Ltd. All rights reserved, DACS 2015. Photo: Prudence Cuming Associates Ltd

JACKSON POLLOCK

www.jackson-pollock.org

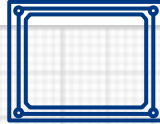
Jackson Pollock (1912-1956, USA) was the chief pioneer of the art movement known as Abstract Expressionism. This movement was defined by the aim to make art that was both abstract and expressive of emotion, inspired by the Surrealist idea that art should come from the unconscious mind.

Pollock became famous through his unusual method of placing the canvas flat on the floor and dancing around it whilst spontaneously pouring and dripping paint from its can. This form of painting, also known as 'action painting', was understood to directly relate to the artist's

emotions, expression, and mood. Although Pollock's work has been previously disregarded as accidental or formless, the artist was indeed very concerned by composition and achieving a sense of visual harmony.

Pollock said about his work: "On the floor I am more at ease. I feel nearer, more a part of the painting, since this way I can walk around it, work from the four sides and literally be in the painting" and "When I am in a painting... I have a general notion as to what I am about. I can control the flow of paint: there is no accident."

Sources: <http://painting.about.com/library/biographies/blartistquotespollock.htm>





How do objects move on different surfaces?

In this activity children will explore how objects move on different surfaces. Children will create rubbings to test and explore the surfaces, which they will then use to predict how they think the object will move on them. By spinning coins and tops, pushing coins and rolling balls down a ramp onto different surfaces, children will then explore how these surfaces affect the object's movement. Children will then create bar charts to record how far the object travels or for how long it spins.

National curriculum

SCIENCE OBJECTIVES

Pupils should be taught:

- ☐ That a force is required for an object to start moving (not national curriculum).
- ☐ To compare how objects move on different surfaces.

ART AND DESIGN OBJECTIVES

Pupils should be taught:

- ☐ To create rubbings to record their observations, and to use them to review and revisit ideas
- ☐ To investigate and combine visual and tactile qualities of materials and processes, and match these qualities to the purpose of the work.
- ☐ To improve their mastery of art and design techniques, including drawing and mark-making.

RESOURCES

- ☐ Ball
- ☐ Coins
- ☐ Spinning tops
- ☐ Small white boards to be used as ramps
- ☐ Different surfaces – sandpaper, foam, plastic, carpet, felt etc
- ☐ Thin paper
- ☐ Crayons
- ☐ Stop watch
- ☐ Measuring ruler



1 Separate the class into four groups and give each group at least two surfaces to test. Each child should start by placing paper over the surface and rubbing over it with a wide crayon.

2 As a class, ask each group to describe their rubbing:

a What has created the different tones in the rubbing?

b How would you describe the visual texture of the rubbing?

3 Introduce the different activities – spinning a coin, pushing a coin, spinning a top, and rolling a ball down a ramp.

4 Demonstrate one of the activities, for example, rolling a ball down a ramp onto a piece of carpet.

Q Ask the children to think about:

a Why did the ball stop?

b What is slowing it down?

At this stage it is acceptable for the children to say that the carpet is slowing it down.

5 Provide each group with the additional resources for one of the activities on the Resource Sheet. Allow enough time for each group to test at least two of their surfaces during each activity.

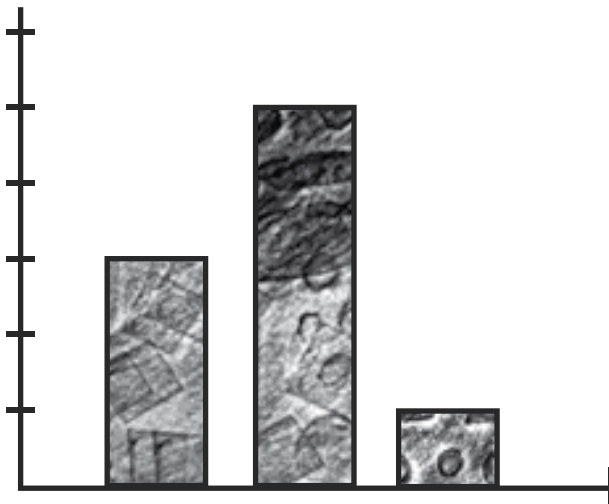


TEACHER'S NOTES:

The different activities can be set up as a carousel so that as the children complete each activity they can move onto the next. It would work well to set up 8 stations, with two sets of resources for each activity. Ensure each group keeps the same surfaces for each different activity.

- 6 Once they have tested all activities, ask each child to draw and label the axes to present the data from one of the activities.

The bars on the bar chart can be created by cutting rectangles of the appropriate length from the rubbings created earlier. From the rubbings of the surfaces, cut a rectangle the same size as the distance that the object travelled or the amount of time that it was spinning – for example if it travelled 59cm make a rectangle that is 59mm long.



- 7 Ask the children to compare the graphs for the different activities.

Q For example, ask the children: Is the shape of the graph the same i.e. is the same material always the longest bar?

- 8 Provide a new surface that no-one has used. Ask them to explore this by creating a rubbing. Ask them to predict the length of the bar for this surface in each activity.

Q Why do you think this?

- 9 Add the bar to the graph. Test this material using one of the activities to see if the evidence matches their prediction.
- 10 Establish that the rougher surfaces slowed the objects down more quickly.

TEACHER'S NOTES:

Highlight the fact that you would not expect the result to be exactly as they predicted, but was it close?

EXTENSION ACTIVITY

For children who have looked at this previously, the focus can be more on using the rubbings to predict how far or for how long they think the object will move.

SCIENCE

- ☐ Can the children measure and record in an appropriate way?
- ☐ Can the children present their results in a bar chart?
- ☐ Can the children use their results to rank the materials?
- ☐ Can the children use their results to make a prediction about another surface?
- ☐ Are the children able to say if their final result supports their prediction?

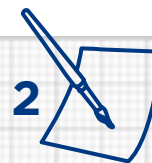
ART AND DESIGN

- ☐ Can the children describe the different textures in both the visual texture of their rubbings and the actual texture of the surfaces?
- ☐ Can the children describe the different tones in their rubbings and what has created these differences?
- ☐ Can the children suggest what materials they could use to make very rough/scaly/hairy/furry/smooth surfaces?
- ☐ What marks could be used to suggest a rough/shiny/smooth/dirty/scaly/furry surface?

SPINNING COINS

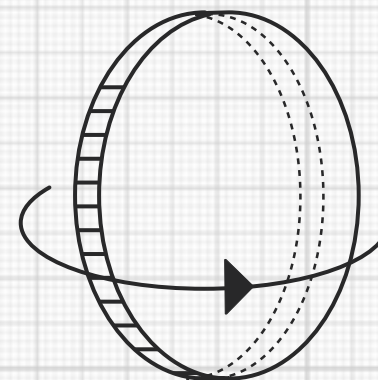
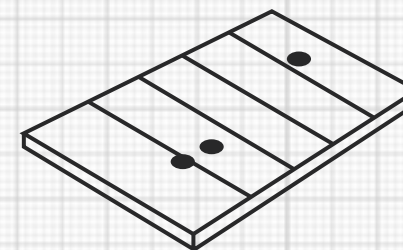
☞ Spin the coin

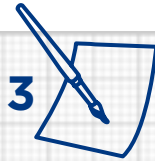
- How long does it spin on different surfaces?
- What will you use to measure this?
- How can you record your results?
- Do you need to check any of your results?

PUSHING COINS

☞ Place the surfaces at the edge of the table. Place the penny on the surface with half the penny hanging over the edge of the table. Hit the penny with the palm of your hand to make it move.

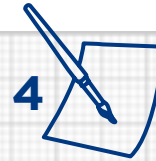
- How far does it move on different surfaces?
- What will you use to measure this?
- How can you record your results?
- Do you need to check any of your results?

1**2**

SPINNING TOPS

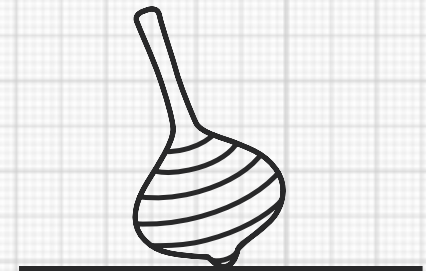
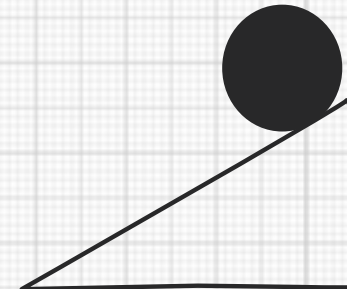
☞ Spin the top

- How long does it spin on different surfaces?
- What will you use to measure this?
- How can you record your results?
- Do you need to check any of your results?

BALL ON A RAMP

☞ Release the ball from the top of the ramp

- How far does it travel on different surfaces?
- What will you use to measure this?
- How can you record your results?
- Do you need to check any of your results?

3**4**

Can magnets be used to move objects?

In this activity children will test the strength of different magnets and begin to explore which materials have magnetic properties. Inspired by exhibiting artist Lyndall Phelps' work, the activity will test out the strength of each magnet by looking at how many paperclips it can hold and the heaviest object it can lift. The activity will then lead children to explore how magnetic objects can be moved, and why some objects move and other not. This activity can be extended by creating an animation documenting how the objects move or using a force-meter to determine a magnet's strength.



National curriculum

SCIENCE OBJECTIVES

Pupils should be taught:

- ☐ To explore the strength of magnets.
- ☐ To observe how magnets attract or repel each other and attract some materials and not others.

ART AND DESIGN OBJECTIVES

Pupils should be taught:

- ☐ To investigate materials and processes used in art, craft and design and how these can be matched to ideas and intentions.
- ☐ To develop their techniques, including using animation techniques with creativity and experimentation.
- ☐ To develop their knowledge about contemporary artist Lyndall Phelps.

RESOURCES



- ☐ A range of magnets of different shapes and sizes
- ☐ Paper clips
- ☐ Other small magnetic and non-magnetic objects
- ☐ Paper
- ☐ Magnetic board
- ☐ Force-meter
- ☐ Animation guide
- ☐ Digital Cameras that will record still images and video (E.g. Canon SureShot, iPhone)



1 Play the clip https://www.youtube.com/watch?v=5l16hCIS_x4.

Before watching ask the children to think about what is making the objects move?

2 Provide pairs of children with one magnet and the Resource Sheet between them. Ask them to use their magnet to complete each of the tests.

3 Put the pairs into groups of four or six to compare their results. Ask the children:

- a Are their results all the same?
- b Why are they different?
- c What does this tell you about the magnets?

4 Ask the children to think about which method on the Resource Sheet is the best to test the strength of different magnets. When the children have decided on their preferred method give them five or six magnets to test.

TEACHER'S NOTES:

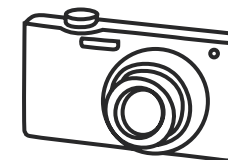


Children should identify that some magnets are stronger than others.

5 Provide each group with a tray holding a collection of magnetic and non magnetic materials and magnets.

6 Ask the children to select one magnet to see if they can make the objects move.

7 When they have tested this out, ask the children to repeat the activity and use a video camera to record the movement.



 Ask the children:

- a** To describe how the objects move?
- b** Which objects are attracted to the magnet?
- c** Which objects are not?
- d** How do these objects move?
(Pushed by the magnetic objects)

8 Referring back to the film, show the children the artist Eadweard Muybridge's work from the Artist Resource Sheet to show how still images can be used to create an animation and capture movement. This is only for reference.

9 Using the photographs taken by the students, create a short animation film using To Animate for a PC or iPad or a free online gif animation programmes, for example <http://gifmaker.me/>

10 What words would the children use to describe the movement of the objects? Can they create a story about the way the objects move?

SCIENCE




- ☐ Can the children choose an appropriate method to test the strength of a magnet?
- ☐ Can the children talk about the strength of different magnets?
- ☐ Can they give reasons why their method was effective or not?
- ☐ Can they identify magnetic and non-magnetic objects?

ART AND DESIGN



- ☐ Can the children describe how the objects moved?
- ☐ Can the children associate this movement with something else, for example an emotion or an animal?
- ☐ Can the students record and develop ideas on film and suggest other applications for what they have learned?
- ☐ What have students learned about line, shape, form and colour and how to use them in an animated film?
- ☐ What other ways could students record what they learned?

EXPLORING A MAGNET

 Use one magnet to carry out each of the following tests:



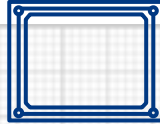
METHOD	RESULT
1 How many paper clips can your magnet hold in a chain (not connected)?	
2 How many pieces of paper can your magnet hold on the board?	
3 What is the distance between the magnet and the table when a paper clip jumps up?	
4 What is the distance between the magnet and the paper clip when it slides along the table?	
5 What objects can your magnet pick up? Which is the heaviest object it can pick up?	
6 Use a forcemeter to measure the attractive force of your magnet	

LYNDALL PHELPS

www.lyndallphelps.com

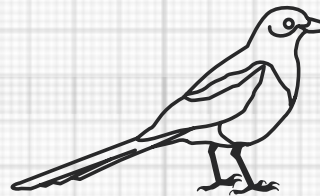
Exhibiting artist **Lyndall Phelps** worked with scientist Max Boleininger and teachers from All Saints CE and Hotham Primary Schools, to research the possibilities of forces and magnets. Phelps has developed a series of installations that invite visitors to explore and interact with the imperceptible effects magnets have on their surroundings.

Phelps' work is site/context specific and strongly process based, relying on research and collaboration with a broad range of individuals and organisations. Drawn to an eclectic mix of subjects including history, flora, fauna, the military, flight, horticulture, architecture, the decorative arts and women's craft, Phelps aims to uncover the highly personal and emotive within traditionally academic and scientific frameworks.

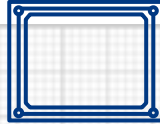


Phelps' work is deliberately playful, sometimes magical and at times surreal: a pigeon falls from the sky attached to a parachute, a taxidermy magpie uses radar countermeasures for protection and forensic markers invade the attic of a National Trust property.

Phelps hopes to invite a sense of wonder and that people will be curious and intrigued where the distinction between fact and fiction is difficult to ascertain. Often combining a range of media including sculpture, photography, video, sound and works on paper, Phelps offers a glimpse into the unfamiliar or a chance to see the familiar in a different light.



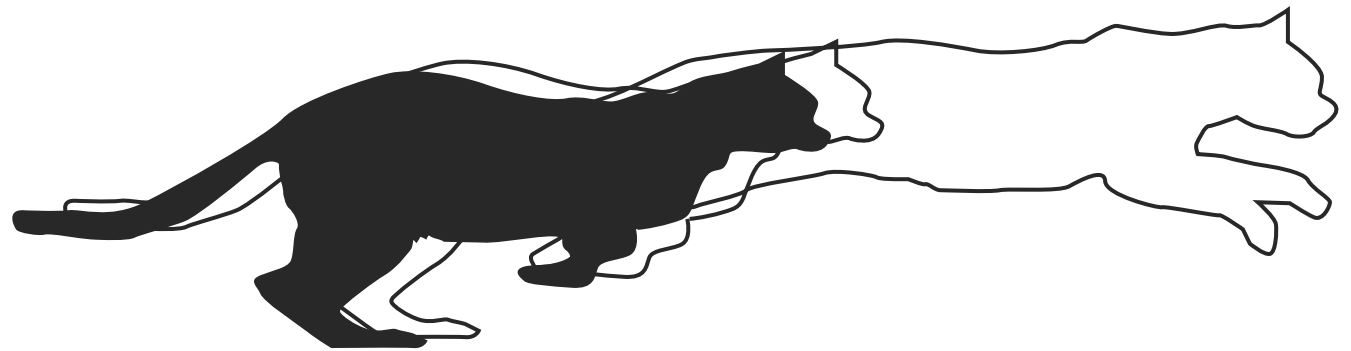
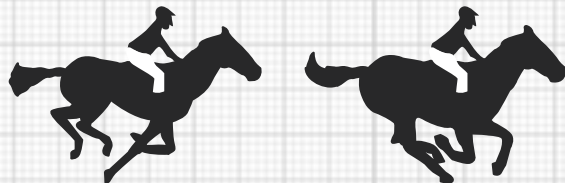
Lyndall Phelps, *Perceptible Invisibility*. 2015 ©Eion Carey

EADWEARD MUYBRIDGE

www.eadweardmuybridge.co.uk

Eadweard Muybridge (1830–1904, UK) was a photographer celebrated for his early, pioneering work in photographic studies of motion and early experiments in motion-picture projection.

Muybridge is also known as a pioneer for his work on animal locomotion, which used multiple cameras to capture an animal in movement to produce stop-motion photographs.





How can you make an object move using magnets?

In this activity children will explore materials that are magnetic and non-magnetic in order to learn that some but not all metals are magnetic. Inspired by exhibition artist Lyndall Phelps' work, children will create wire sculptural flowers held in a polystyrene base and investigate how these respond to a magnet.

National curriculum

SCIENCE OBJECTIVES

Pupils should be taught:

- ☐ To observe how magnets attract some materials and not others.
- ☐ To compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.

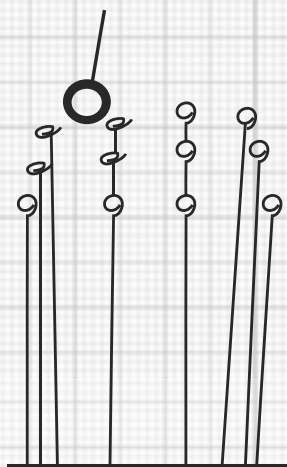
ART AND DESIGN OBJECTIVES

Pupils should be taught:


- ☐ To investigate materials and processes used in art, craft and design and how these can be matched to ideas and intentions.
- ☐ To develop their techniques, including their control and use of wire materials with creativity and experimentation.
- ☐ To develop their knowledge about contemporary artist Lyndall Phelps.

RESOURCES


- ☐ Sand tray with magnetic and non-magnetic objects buried in it
- ☐ Magnets
- ☐ A range of magnetic wire and non magnetic wire
- ☐ Artist images
- ☐ Polystyrene foam board





1 Bury a range of magnetic and non-magnetic objects in a sand tray. Ask one child at a time to stir the sand using a magnet to pick up an object. What do they notice about all the objects that have been picked out?

 They are all made of metal. These metal objects are magnetic and so are attracted to the magnet.

2 When no more objects can be drawn out ask the children if they think there are any objects left in the sand. Why has the magnet not picked them out?

 They are not attracted to the magnet as they are not magnetic.

 What material might these other objects be made from?

 At this stage the children are likely to suggest non metallic materials. Non-magnetic metals will be highlighted at the end of the lesson. Leave the objects in the tray until the end of the lesson.

3 Looking at Lyndall's work in the Artist Resource sheet, the children will create simple wire flower sculptures using a combination of magnetic and non-magnetic wires. Do not make a distinction on the basis of magnetic properties with the children at this stage.

4 Using a polystyrene foam board, thread the wire through the board and back out again (this will mean that the wire is held safely).

5 At the top of the wire, twist different forms to create flower head shapes.

6 Move a magnet over the top of the work, testing out which wire moves. You may need to attach the board to a table so that it is secure.

7 Why do some wires move and others not? Ensure the children understand that some but not all metals are magnetic. Only iron and metals alloys that contain iron such as stainless steel are magnetic. There are many familiar non-magnetic metals e.g. gold, silver and aluminium.

🗨️ Ask the children whether the flower head affects how the flowers move.

👉 Note that a larger surface area of wire will mean that the flowers move more.

🗨️ Ask the children:

Ⓐ How does the form of the flower affect the movement?

Ⓑ How does the size of the flower affect the movement?

8 The children can create a field of these flowers, using the selected flower heads.

9 Ask the children to use their hands to get the rest of the objects out of the sand tray. Sort these into objects made of metal and non-metal.

👉 Check that the metal objects are not attracted to the magnet to highlight again that not all metals are magnetic.

SCIENCE



☐ Can the children distinguish between metal and non-metal objects?

☐ Can the children use evidence to prove that some but not all metals are magnetic?

ART AND DESIGN



☐ Can the children describe how the flowers moved?

☐ Can the children describe how the form of the flower head affected the movement?

☐ Can the children suggest ways to record how the flower heads moved?

☐ How would they suggest movement if they were only drawing or painting the flower heads?

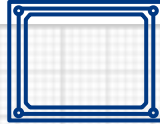
☐ Which of the formal elements of line/ tone/ colour/ shape/ form/ texture/ structure/ pattern are the most important in this piece of work?

LYNDALL PHELPS

www.lyndallphelps.com

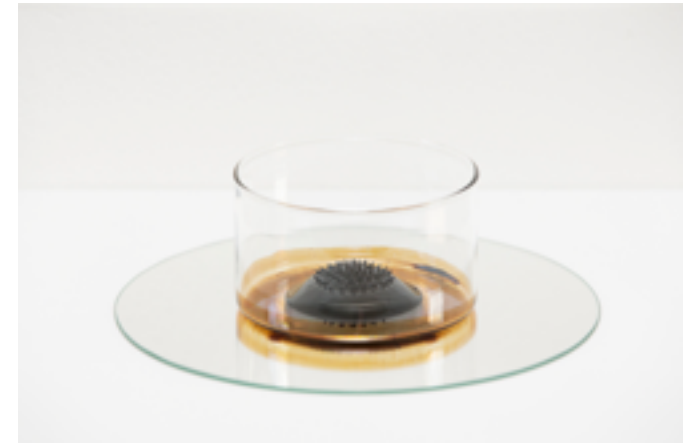
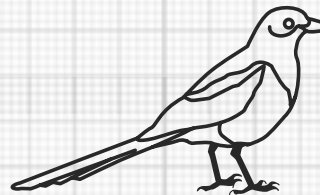
Exhibiting artist **Lyndall Phelps** worked with scientist Max Boleininger and teachers from All Saints CE and Hotham Primary Schools, to research the possibilities of forces and magnets. Phelps has developed a series of installations that invite visitors to explore and interact with the imperceptible effects magnets have on their surroundings.

Phelps' work is site/context specific and strongly process based, relying on research and collaboration with a broad range of individuals and organisations. Drawn to an eclectic mix of subjects including history, flora, fauna, the military, flight, horticulture, architecture, the decorative arts and women's craft, Phelps aims to uncover the highly personal and emotive within traditionally academic and scientific frameworks.



Phelps' work is deliberately playful, sometimes magical and at times surreal: a pigeon falls from the sky attached to a parachute, a taxidermy magpie uses radar countermeasures for protection and forensic markers invade the attic of a National Trust property.

Phelps hopes to invite a sense of wonder and that people will be curious and intrigued where the distinction between fact and fiction is difficult to ascertain. Often combining a range of media including sculpture, photography, video, sound and works on paper, Phelps offers a glimpse into the unfamiliar or a chance to see the familiar in a different light.



Lyndall Phelps, *Perceptible Invisibility*. 2015 ©Eion Carey

How do magnets repel or attract other magnets?

In this activity children will discover how they can make an object move using attraction and repulsion. They will explore this by creating simple origami boats containing a magnet which they will try to move across the surface of a table and through water. This activity could be further developed by using a compass to identify what direction the boats in the water face, linking this to the fact that the Earth is a giant magnet.



National curriculum

SCIENCE OBJECTIVES

Pupils should be taught:

- ☐ To observe how magnets attract or repel each other, and attract some materials and not others.
- ☐ To describe magnets as having two poles.
- ☐ To predict whether two magnets will attract or repel each other depending on which poles are facing.

ART AND DESIGN OBJECTIVES

Pupils should be taught:


- ☐ To investigate materials and processes used in art, craft and design, and how these can be matched to ideas and intentions.
- ☐ To develop their techniques, including using origami techniques.

RESOURCES

- ☐ Thick A3 paper
- ☐ Magnets
- ☐ Magnetic objects
- ☐ Water Basin
- ☐ Print out of boat template (see Resource Sheet)




1 Demonstrate how to follow the origami boat template to create a paper boat. Provide the children with a range of different types of paper that they can experiment with.


 Ask the children which paper will be best to create their boat?

2 Using the template, make sure that the children fold and tape down the middle part of their boat so the bottom is flat.


3 Place a strong magnet in the middle of this boat and put it in the centre of the table. This might need to be taped down so that it sits flat on the bottom of the boat.

 Ask the children to think about different ways to make the boat move without touching it. Provide additional magnets and magnetic materials. How many different techniques can you use to make the boat move?

4 Highlight that the boat can be moved by using a magnet or magnetic material to attract (pull) it. A magnet can also be used to repel (push) the boat away. The boat could also be moved by tipping the table.

 They may try to blow it.

5 Explain to the children that magnets all have two ends known as poles – a north and south pole.

 Ask them to explore the attractions and repulsion between two magnets.

 What pattern do they notice?

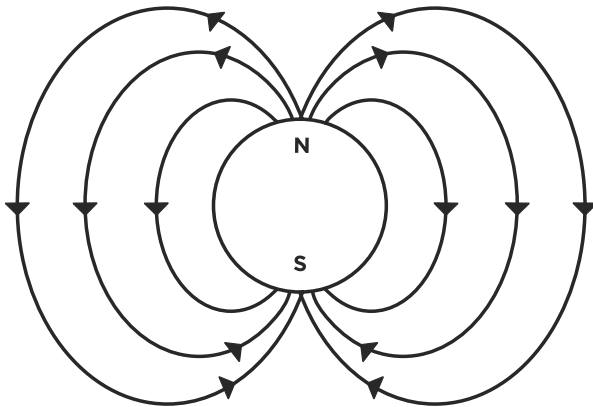
6 Highlight the pattern that two like poles repel and unlike poles attract.

7 Now place the boat in a basin of water. Is it easier to make the boat move?

EXTENSION ACTIVITY

Use a compass to work out which direction the boats are facing. Do the boats line up in the same direction? What direction do they line up in?

👉 Refer to the Earth being a giant magnet.



SCIENCE



- ☐ Can the children explain which materials are more suitable for the boat and why?
- ☐ Can the children demonstrate and explain how to move the boat?
- ☐ Can the children identify when two magnets are attracting and repelling each other?
- ☐ Can they predict whether a magnet will attract or repel, based on the orientation of its poles?

ART AND DESIGN

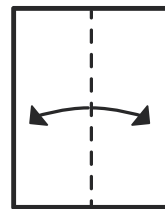


- ☐ Are there any types of paper that would be better than others for making the boats? What paper would be best and what would be worst?
- ☐ What else could you use to make a small boat? What materials would be most effective and why?
- ☐ What other things could be made from folded paper, and how would you use them?
- ☐ How else could you make origami objects move? Which ways are best and why?
- ☐ Which of the formal elements are the most important when you make your paper boats and why?

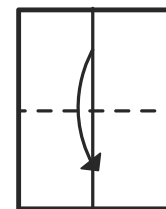
BOAT TEMPLATE

Details and instructions on how to make an origami boat can be found on this link:

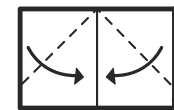
<http://www.origami-fun.com/support-files/origami-boat-print.pdf>



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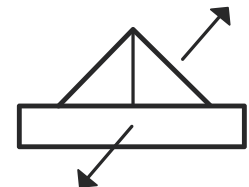
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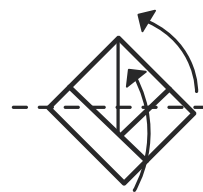
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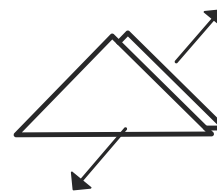
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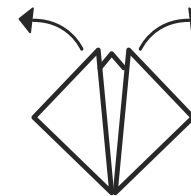
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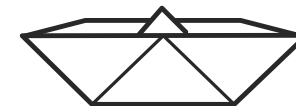
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Create a wire mobile that moves with both forces and magnets

In this activity children will use the work created in Activity 1 to create mobiles inspired by the work of artist Alexander Calder. By cutting out their paintings and attaching wire to the back to create a mobile, children will be able to explore how the wind and magnets make their work move.



National curriculum

SCIENCE OBJECTIVES

Pupils should be taught:

- ☐ That a force is required for an object to start moving (not national curriculum).
- ☐ To observe how magnets attract or repel each other and attract some materials and not others.

ART AND DESIGN OBJECTIVES

Pupils should be taught:

- ☐ To develop their techniques, including their control and use of working with wire.
- ☐ To experiment with a variety of shapes for their mobile and to record how different shapes change the way the mobile moves and affect how it looks.
- ☐ To communicate their observations, ideas and feelings about their designs.
- ☐ To improve their knowledge of great artists in history, including the contemporary artist Alexander Calder

RESOURCES



- ☐ Artist Images, Animation Guidance, computer
- ☐ PowerPoint and Photo Editor Software
- ☐ Wire and previously created mark making images
- ☐ Soft wire lengths, wood kebab sticks (sharp ends cut off)
- ☐ Scissors
- ☐ String or thread
- ☐ Magnets



STEP 1

1 Show the children the example artwork by artist Alexander Calder in the Artist Resource Sheet or click on the link below to see other examples of Calder's work.

a Alexander Calder, *Antennae with Red and Blue Dots* c.1953. [Click here](#)

2 Discuss with the class:

a How they think these pieces might move.

b What forces the artists are working with?

3 Using the paintings that they created in Activity 1, the children draw outlines of different sized shapes onto their paintings and cut these out.

TEACHER'S NOTES:



☞ The children might discuss how the wind will move the work and also how balance will affect the sculpture.

☞ The children could cut out two shapes of the same size so the wire is hidden in between them. Magnets can also be attached into the inside of these shapes too.

4 The children will then need to attach wire around the edge of the back side of their shapes using sticky tape leaving a loop of wire at the top. This will be used to hang the shape on the mobile.

5 With the wire firmly attached, the children can then manipulate the shapes by curving, twisting and joining them to create 3D forms.

STEP 2

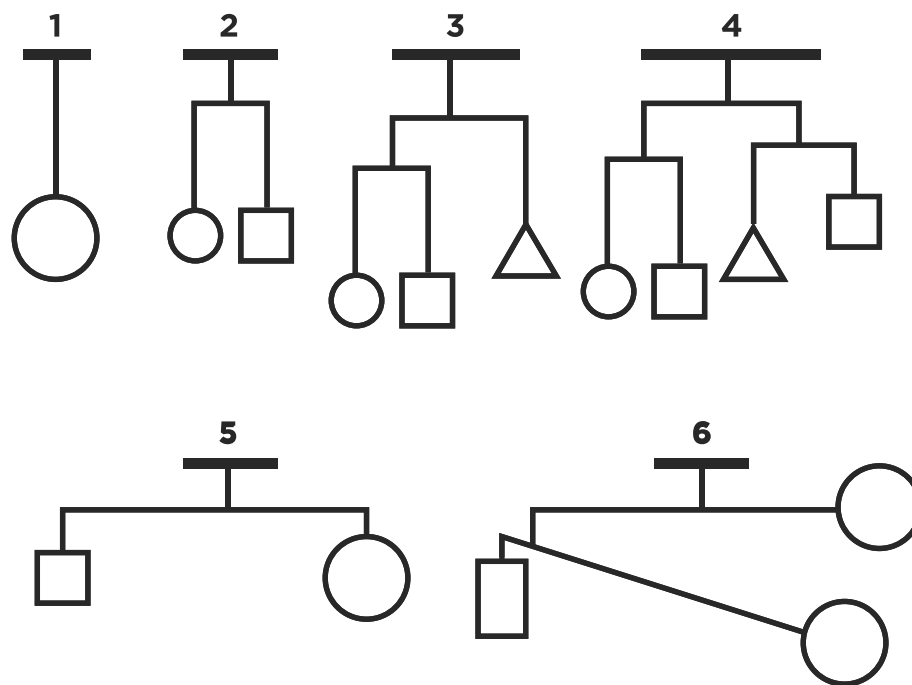
6 As a class, refer back to Alexander Calder's work and introduce the children to the next step, in which they will be creating a hanging mobile using sticks.

7 Ask the children to work in small groups to build a mobile using the wire-framed shapes they have previously made.

8 Attach thread or string to the loop at the top and hang this on the mobile.

Use the Resource Sheet to look at different ways that shapes can be attached to a mobile.

9 Once the mobile is completed and hanging freely, ask the children to experiment with magnets to make it move in one direction or another.



🗣️ Ask the children:

- Ⓐ Can they move the separate elements in different directions at the same time?
- Ⓑ What happens when you blow on the mobile – do the different shapes move differently?
- Ⓒ Put the mobile in different places around the school to see how it is affected by wind.
- 10 Refer back to the learning in Activity 1. The mobile can be moved by the wind – a contact but invisible force. It can also be moved by magnetism – a non-contact force.

SCIENCE



- ☐ Can the children demonstrate and explain how the mobile can be moved using a magnet?
- ☐ Can the children explain why it was important to add the wire to the paper shapes?
- ☐ Can the children demonstrate and explain how the mobile can be moved using air?

ART AND DESIGN

- ☐ Can the children describe how the shape and form affects the way the mobile moves?



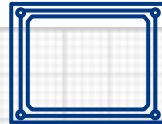
- ☐ How would the children describe the way in which the mobiles move?
- ☐ What are the best shapes to use in a mobile?
- ☐ What are the best materials to use for a mobile?
- ☐ Can they suggest ways to make the mobile more interesting to look at?
- ☐ What effect does colour have on the way the mobile appears?
- ☐ What other things do they know that move through the air?

ALEXANDER CALDER

www.calder.org

Alexander Calder (1898-1976, USA) was an American sculptor known best for his hanging abstract 'mobiles' – a term that Marcel Duchamp coined to describe these sculptures. Calder's mobiles are regarded as artworks that redefined sculpture by introducing the element of movement to a discipline previously only considered static.

Calder would cut flat, abstract shapes from sheet steel, which were then boldly painted and assembled in a balanced chain-linked system so that the shapes would be set in motion by air currents.



The mobiles followed a similar visual language to that of early abstract painting.

Calder said of his work: "Just as one can compose colors, or forms, so one can compose motions."

Sources:

<http://www.tate.org.uk/art/artists/alexander-calder-848>

<http://www.gagosian.com/artists/alexander-calder>



Alexander Calder, *Cascading Flowers*, 1949, sheet metal, wire and paint, 88" x 102", National Gallery of Art, Washington D.C.; Gift of Mr and Mrs Klaus G. Perls, 1996
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